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A NEW GENERATION OF MAGNETIC ROLL SEPARATORS BASED ON RARE-EARTH MAGNETS FOR CONCENTRATION AND PURIFICATION OF WEAKLY MAGNETIC MATERIALS

O. A. Dolgoplov¹

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Magnetic roll separators on rare-earth magnets are suitable for removing iron impurities from various materials. The advantages of these magnetic separators over traditional ones are demonstrated.

A new generation of magnetic separators produced by the Érga company has been developed based on long-term work experience. They combine the latest technological achievements of magnetic concentration and the proper industrial production of permanent magnets based on NdFeB and SmCo.

The purpose of the new series of magnetic separators was the implementation of contemporary effective solutions in the field of dry magnetic concentration. The current shortage of high-quality materials has underlined the need to promote cost-effective technologies for treating raw materials to achieve their high quality.

Rare-earth highly inductive magnetic separators SMVI are used to treat various raw materials for which the traditional methods of treatment on low-capacity dry drum separators or powerful inductive electromagnetic roll separators do not ensure the prescribed requirements on purification.

The rare-earth roll separator has been developed to achieve the maximum separation efficiency and is usually applied when a high degree of purity is needed. To develop a magnetic field with high induction and high resistance to demagnetizing factors, magnetic systems in rare-earth roll separators SMVI are made from a special alloy of NdFeB developed by the Érga researchers for this type of separators, whose attractive force is at least 10 times higher than in traditional ceramic magnets and is commensurable with electromagnets. In developing the new alloy we took into account the possible use of the separator in high-temporary media. Magnetic separators SMVI are capable of separating particles from a material flow within a wide magnetic sensitivity range at the temperature of the material up to 120°C.

The device and its principle. The separator is a mini-conveyor contained in a case with a distributing material feed system and a device for the separation of flows based on

magnetic properties. The main part of the separator is the leading magnetic roll with magnetic induction on its surface ranging from 1.1 to 1.5 T. The rare-earth magnetic roll is used as the drive pulley; a thin belt is the transporting element connecting the roll with the nonmagnetic driven pulley. The transporting element is a special thin graphite-filled Kevlar belt with a Teflon outer coating which has high wear resistance and decreases as much as possible magnetic induction losses. As a result of this, the magnetic induction of the working surface zone ranges from 1.0 to 1.7 T. Due to the cantilever structure, a single mechanic can quickly replace the belt (in less than 5 min). The separator is equipped with a frequency drive to regulate the velocity of the separated material, a peephole, aspiration holes, and a remote control panel.

The material to be separated is supplied vertically to the distributing vibration device, creating a uniform product layer in the zone of the magnetic field. The product on the moving belt is transported to the magnetic roll in the separation zone. When the separated material enters the zone of effect of the magnetic field, magnetic and (or) paramagnetic particles are attracted to the roll, thus changing their route, and become cut off by the flow distribution system, whereas the nonmagnetic material continues motion following its natural route.

Rare-earth roll separators depending on their technological specifics are produced in 1-, 2-, and 3-level versions with magnetic or nonmagnetic recurrence.

Technical specifications:

- standard roll diameter 105 mm;
- roll width from 300 to 1200 mm;
- magnetic field on the magnetic circuit output is higher than 1.0 T (up 1.7 T);
- standard Kevlar belts;
- energy-independent magnetic field;
- standard models have 1-, 2-, and 3-level versions;

¹ Érga Research-and-Production Company, Russia.

- a compact module structure;
- steady controlled supply of materials into the rare-earth roll magnetic separator using a vibration feeder;
- possibility of treating particles of various sizes;
- effectively attracts paramagnetic and very fine ferromagnetic materials.

Application area. Rare-earth roll separators are used in various sectors of industry as the most effective separation systems to purify nonmagnetic materials.

Magnetic rare-earth roll separators are intended to effectively decrease the amount of iron in quartz sand, corundum, dinas sand, magnesite, calcium carbonate, bauxite, feldspar, and other materials by removing iron-bearing impurities. SMVI separators are effective in additional concentration of quartz sand and feldspar materials used for batch preparation at glass factories, which significantly lowers the content of Fe_2O_3 in the composition of the glass melt.